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making innervation very closely associated with actual muscular contraction and the discharge of nervous energy, the second being little more than the volitional impulse. The author's chief criticism is directed against the first conception. He points out complications into which the theory is driven when it tries to show why innervation of the internal and external recti for different degrees of convergence should give the notion of differences of distance in the third dimension, while that of the other ocular muscles, or even of the recti themselves for parallel motion, gives nothing of the kind. The difficulty of accounting by this theory for the localization at the same time of a pair of homonymous and a pair of heteronymous images is also urged. Since their place depends on innervation, there would have to be innervation at the same time and of the same muscles for different distances. Moreover, it can be shown by experiment that localization may vary with attention, while the position of the eyes and, presumably, the innervation that controls them, remains the same. Against the other form of the theory is urged that it makes a useless distinction of central and peripheral sensations in distinguishing those of innervation from others when all are really central.

Geschmacksprüfungen. KARL RITTMAYER. pp. 28. Göttingen Diss. 1885.

After reviewing the various opinions regarding the portions of the mouth cavity capable of perceiving taste, Rittmeyer made an independent investigation, thoroughly cleansing the tongue after each test, and avoiding contact with the edges of the tongue. He experimented upon ten persons, and found in every case a sensibility to taste outside the tongue—properly and especially (if not exclusively) upon two regions, a portion of the soft palate and the arcus glossopalatinus. Denoting a very pronounced taste sensibility by 1, a minimum sensibility by 4, and with 2 and 3 intermediate, the results for the four cardinal tastes in the average of ten persons were as follows:

For *sweet*, in nine cases the root of the tongue was 1, the edge 2, the tip 3, the soft palate 3-4, the arcus glossopalatinus 4. In one case the tip was 1, the edge 2, and the root 3.

For *salt*, in five cases the result was precisely the same as for the nine cases with sweet; of the remaining five cases, two differed merely in marking the soft palate 4 instead of 3-4, two differed by conforming to the exceptional instance with sweet, and one differed by marking the tip 4 and the soft palate 3.

For *sour*, the root of the tongue is marked 1 twice, 2 three times, 3 four times, and 4 once. The edge is marked 1 seven times and 2 three times. The tip is marked 1 once, 2 four times, 3 four times, and 4 once. The soft palate, 3 twice, 3-4 once, 4 seven times. The arcus glossopalatinus, 3-4 once, 4 nine times.

For *bitter*, the root is marked 1 nine times and 2 once. The edge, 2 nine times and 3 once. The tip 1 once and 4 nine times; the soft palate, 2-3 ten times. The arcus glossopalatinus, the same. This would make the root of the tongue best for sweet and bitter, the edge best for sour. Besides minor variations, one of the ten individuals shows a decidedly different distribution of sensibility from the other nine.

Next, the connection of the organs of taste with the nerves is discussed and illustrated by pathological instances. All agree in making the glossopharyngeal the taste-nerve for the root of the tongue, but the opinions vary regarding the connections of the anterior two-thirds of the tongue.

Next, the effect of various drugs upon the taste organs was tried, with the result of showing that *alumen crudum* and *zincum sulphuricum* in solutions of 1.25-1.5 per cent had the most decided effect. Testing the same subjects as before, and denoting a slight weakening of the sensory effect by A, a stronger one by B, a very strong one by C, and a total absence of taste by O, we have the following result:

For *sweet*, the root is marked A twice, B eight times. The edge is marked B once, C three times, and O six times. The tip, C once, and O nine times. The soft palate and arcus glossopalatinus each, B once, C once, and O eight times.

For *salt*, the root is marked A three times, C seven times. The edge, A five times, B four times, and C once. The tip, C ten times. The soft palate, B five times and C five times. The arcus glossopalatinus, C ten times.

For *sour*, the root was marked A once, B once, and C eight times. The edge, A five times, B twice, and C three times. The tip, A once, B seven times, and C twice. The soft palate and arcus glossopalatinus each, B seven times, and C three times.

For *bitter*, the root was marked A ten times. The edge, A twice, B seven times, and C once. The tip, O ten times. The soft palate, A once, B twice, and C seven times. The arcus glossopalatinus, A twice, B eight times. In other words, the root of the tongue loses its perception of taste least under the action of drugs, the edges next, then the soft palate and arcus glossopalatinus, and most readily the tip. Again, the root retains best its taste for bitter, next for sweet, third for salt, and last for sour. The edge retains the other three tastes about equally well, but is most liable to lose all taste for sweet. The tip retains best what it tastes best, the sour, but loses absolutely what little taste for sweet and bitter it normally has, retaining a slight taste for salt.

Finally, the application of a 2 per cent solution of cocaine, besides inducing anaesthesia, does away with all taste for as much as half an hour, and longer if the application is allowed to remain. The taste for salt and bitter seems to come back first, that for sweet last.

Action des acides sur le goût. JOSEPH CORIN. Archives de Biologie, VIII, fasc. 1.

The relation between chemical action and sensation of taste is at the simplest with acids. Substances that taste acid are chemically acid. The investigation of this relation is the object of this very commendable research. When the sense of smell is excluded by holding the nose or by using very weak solutions of acid, the following have almost exactly the same quality, though different intensities of taste, and were used for experiment, namely, chlorhydric, phosphoric, oxalic, formic, sulphuric, acetic, nitric, tartaric, citric, hypophosphorous, malic, and lactic. Precautions were observed in making comparisons, to operate always on the same part of the tongue (the tip), to use the same quantity of acid, and to allow the